A Data-Driven Decision-Support Framework for Fashion Supply Chains under Incomplete Disclosure

Xin Su[1], Houhao Ma[*] and Jing Zhong[2]

[1, *] *Beijing Institute of Fashion Technology, Chaoyang District, Beijing 100029, China*
[2] *Faculty of Art and Design, Universiti Teknologi MARA, Shah Alam, Malaysia*
** 182043010@qq.com*

Keywords: Fashion supply chain; incomplete disclosure; AHP–TOPSIS; decision support; sustainability governance

Abstract

Environmental and governance evidence in fashion supply chains is often disclosed through heterogeneous sources with different levels of granularity, which limits its direct use in comparative decision-making. This paper proposes a verifiable data-driven decision-support framework that combines rule-based evidence processing with an Environment–Governance AHP–TOPSIS workflow. Using Stella McCartney's public disclosures as an illustrative case, the study reconstructs three pathway-level archetypes and converts fragmented disclosure evidence into computable decision inputs through a unified scoring rubric. The framework integrates indicator construction, structured coding, AHP weighting, TOPSIS ranking, and robustness testing under alternative weighting scenarios. Results show that the procedure can generate interpretable comparative rankings while preserving an auditable link between public evidence and decision scores. The contribution is not a definitive assessment of real supply chain performance, but rather a methodological demonstration of how incomplete disclosure evidence can be transformed into a transparent, reproducible decision-support process for fashion supply chain analysis.

1 Introduction

In the context of fashion supply chains, sustainability assessment has moved beyond individual environmental compliance issues to a multi-criteria decision problem that includes material selection, procurement configuration, and supplier relationships. The difficulty, therefore, lies not only in the sheer number of signals but also in the heterogeneity of the information itself, as "environmental inputs" relate to signals such as emissions, substitution, and alternative routes. In contrast, "governance signals" relate to transparency, responsible sourcing, traceability, and compliance. The current state of environmental accounting practices clearly shows that environmental information can be incorporated into managerial systems through mapping, quantification, and standardisation of supply chains. Governance information, on the other hand, tends to be disclosed in a fractured manner, with a lack of directly comparable structures, as indicated under real disclosure constraints and commercial information barriers [1].

In this regard, recent research findings suggest that "ethical sourcing," "sourcing traceability," "transparency," etc., are no longer considered "peripheral variables in fashion supply chains"; instead, these variables are now recognised as "governance variables having a significant impact on sustainability performance" [2,3]. However, three limitations remain. First, environmental accounting reports and public governance evidence are often not converted into standardised inputs for multi-criteria decision-making. Second, governance variables are still commonly treated through disclosure review or case interpretation rather than evidence-based and rule-transparent operationalization. Third, although AHP–TOPSIS is widely used in supplier evaluation, many studies assume relatively structured data and do not clearly report indicator dictionaries, scoring rules, or procedures for handling missing values when data are incomplete.

To address these gaps, this study develops a data-driven decision-support framework that integrates rule-based evidence processing with an Environment–Governance AHP–TOPSIS workflow. Using Stella McCartney's public disclosures as an illustrative case, the study reconstructs three pathway-level archetypes and converts heterogeneous disclosure evidence into verifiable, comparable, structured inputs. The aim is not to produce a definitive judgement on overall brand sustainability performance, but to demonstrate a transparent decision-support process under conditions of incomplete public disclosure.

2. Related Work

Sustainability assessments of supply chains no longer confine themselves to single environmental performance metrics but are increasingly shifting towards comprehensive evaluations that consider environmental factors alongside governance conditions. Research within the fashion industry indicates that traceability, transparency, and stakeholder collaboration collectively influence sustainable supply chain performance. Consequently, evaluation frameworks that rely solely on environmental variables often struggle to adequately account for observed variations [3]. Concurrently, brand disclosure research indicates that corporate public information predominantly remains at the level of policy commitments, procedural descriptions, and disclosure texts, with limited revelation of actual performance and supply chain consequences. In other words, while governance evidence is crucial, it typically proves difficult to directly incorporate into comprehensive evaluation models without being formalised and operationalised [4,5].

Within the environmental dimension, environmental accounting tools translate diverse environmental impacts into comparable management inputs, thereby enhancing metric comparability and providing a basis for resource allocation [1]. On the governance front, ethical sourcing, traceability, and transparency are not peripheral variables but critical conditions influencing the sustainable implementation of fashion supply chains [2]. The challenge lies in the fact that existing public governance evidence tends to emphasise policy commitments and institutional arrangements. In contrast, granular evidence concerning production sites, labour conditions, and outcome-based performance remains insufficient. Consequently, environmental and governance metrics are often dispersed across different research traditions. Integrating them into a unified decision-support framework typically requires prior standardisation through consistent rule-based processing.

AHP–TOPSIS is a widely used combined methodology for sustainable supplier evaluation. AHP converts decision preferences into pairwise comparison matrices, with consistency tests controlling for weighting bias; TOPSIS generates intuitive rankings based on distance from an ideal solution. Recent research on the apparel industry indicates that this approach is suitable for sustainable supplier selection [6]. However, existing work predominantly focuses on ranking outcomes themselves, with insufficient discussion on operationalising governance evidence, auditing scoring processes, and ensuring result stability under varying weight scenarios. Particularly under conditions of incomplete information and high uncertainty, integrating rule-based reasoning or fuzzy methods with classical MCDM frameworks has been demonstrated to enhance decision systems' robustness and interpretability [7]. Building upon this, this paper adopts the AHP–TOPSIS method as its foundational tool, further incorporating environmental input integration, governance scoring rules, and robustness testing.

3 Methodology

This study employs a data-driven decision-support framework tailored for comparative analysis within fashion supply chains. It integrates an interpretable evidence-processing procedure with the Environment–Governance AHP–TOPSIS methodology to construct a structured computational workflow under public disclosure constraints. The overall process comprises four steps: establishing environmental and governance indicator categories; transforming heterogeneous public evidence into structured evidence units and coded scores; deriving criterion weights through AHP and generating rankings through TOPSIS; and testing result stability through equal-weight control, local perturbation, and scenario comparison. This paper focuses on constructing a Multi-Criteria Decision Making (MCDM) process that is structurally clear, rule-transparent, and results-verifiable for industrial decision-support under constraints on incomplete information. Figure 1 summarises the analytical workflow by linking the public-disclosure case context, evidence coding, AHP weighting, TOPSIS ranking, and robustness testing within a single decision-support sequence.

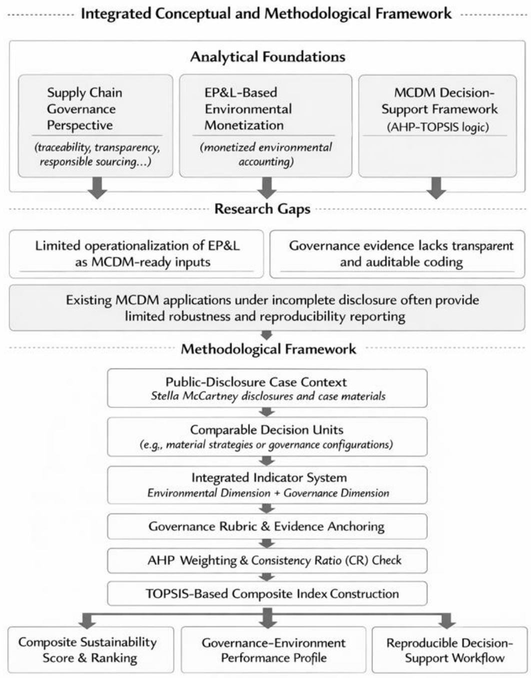

Fig. 1 Integrated Conceptual Methodological Framework

Fig. 1 shows the proposed analytical workflow. Publicly disclosed case evidence is first screened and coded into comparable environmental and governance scores. AHP is then used to derive criterion weights, and TOPSIS is used to rank the reconstructed archetype-based alternatives. The framework supports transparent comparison under incomplete disclosure.

This study employs Stella McCartney as an illustrative case to demonstrate the decision-support workflow under public disclosure constraints. A1–A3 are not independent alternatives at the corporate performance level; rather, they are pathway-level archetypes reconstructed from the same brand's public disclosures. These three options enter the comparative matrix only under unified material sourcing and upstream supply configuration boundaries, and must simultaneously possess verifiable environmental evidence and governance evidence. The purpose of this paper is not to empirically validate real-world supply chain entities, but to illustrate how heterogeneous public evidence can be transformed into comparable, quantifiable, and verifiable decision inputs.

It should be clarified that this study utilises not raw supplier-level databases, but rather publicly accessible corporate disclosures, policy documents, and case materials. Consequently, this research functions more as a framework demonstration than a detailed calculation of entire supply chains. The comparative subjects defined herein are archetype-based alternatives – material strategies, governance configurations, or other procurement-related prototypical schemes reconstructed from case materials that possess fundamental comparability.

Several practical decisions under incomplete public disclosure guide the framework design. First, the analysis is conducted at the archetype level rather than the full-brand level, because public evidence is uneven across pathways and does not support homogeneous whole-system comparison. Second, the indicator set is limited to four criteria so that each criterion remains evidence-extractable, interpretable, and comparable within the current disclosure boundary. Third, heterogeneous environmental and governance evidence is converted into a unified 1–5 ordinal rubric to avoid mixing incompatible raw measures while preserving rule transparency. Fourth, AHP and TOPSIS are combined because the former makes criterion weighting explicit, whereas the latter provides an auditable ranking structure for reconstructed alternatives within a shared analytical boundary.

Combining a literature review with case-study characteristics, this paper establishes two categories of indicators: environmental and governance. The environmental dimension primarily corresponds to publicly available evidence of environmental impacts, emissions-reduction targets, and material substitution. Where direct quantitative values are lacking, this paper employs directionally consistent, standardisable alternative environmental evidence, converting it into calculable scores via a unified ordinal rubric. The governance dimension encompasses responsible sourcing and traceability, supplier conduct standards, modern slavery prevention, transparency disclosure, traceability mechanisms, and implementation support. Indicator selection adheres to three principles: direct relevance to fashion supply chain decision-making, evidence extractability from public sources, and suitability for subsequent rule-based processing.

As governance information predominantly appears in policy texts, statements, or case descriptions, this study employs evidence-anchored standardised scoring for coding. Proxy evidence from environmental items is simultaneously integrated into a unified 1–5 ordinal rubric. Scoring adheres to a fixed progressive scale: 1 indicates no available evidence or only weak signals; 2 denotes principled commitments; 3 signifies institutional arrangements; 4 reflects implementation or project-level evidence; 5 indicates finer-grained execution, traceability, or pathway-level evidence. This rubric assesses evidence strength under public disclosure conditions, not direct homogeneous comparisons of raw dimensions across different dimensions. The detailed evidence-to-score mapping is reported in Appendix Table A1, while the compact decision matrix used for TOPSIS is presented in Table 1.

All scoring was independently conducted by two coders using identical coding sheets; discrepancies were resolved through review to determine final scores. Where evidence was insufficient, missing values were not retained; instead, conservative coding was applied according to uniform rules before entering the decision matrix.

To support structured comparison under incomplete public disclosure, this study adopts an Environment–Governance AHP–TOPSIS workflow. The purpose is not to produce a full-brand sustainability rating, but to develop a transparent, reproducible decision process for comparing reconstructed pathway-based alternatives within a shared analytical boundary.

During the evaluation stage, AHP and TOPSIS serve different functions in the framework. AHP is used to derive criterion weights, while TOPSIS is used to rank the reconstructed archetype-based alternatives. The AHP input consists of pairwise comparisons of the four criteria (C1–C4) provided by five experts with more than 10 years of experience in sustainable fashion supply chains, procurement governance, and decision analysis. The TOPSIS input is the initial decision matrix shown in Table 1, in which A1–A3 are scored against the same four criteria using unified evidence-based coding rules. For AHP, each expert completed a 4 × 4 pairwise comparison matrix using the Saaty 1–9 scale, where 1 denotes equal importance, and 9 denotes extreme importance of one criterion over another. Reciprocal values were used for inverse judgements. Each matrix was checked for consistency before aggregation. The accepted matrices were then combined elementwise using the geometric mean to form the group judgement matrix:

$$a_{ij}^{(G)} = \left(\prod_{k=1}^{K} a_{ij}^{(G)} \right)^{1/K}$$

where$a_{ij}^{(G)}$ denotes the judgment of expert k on criteria i and j, and $K = 5$. The priority vector was derived from the aggregated matrix and normalized to obtain the final criterion weights. Consistency was assessed using λmax, CI, and CR following Saaty's procedure.

For TOPSIS, the coded decision matrix $X = [x_{ij}]$ in Table 2 was first normalized by vector normalization:

$$r_{ij} = \frac{x_{ij}}{\sqrt{\sum_{i=1}^{m} x_{ij}^2}}$$

The normalized matrix was then weighted using the AHP-derived weights to obtain v_{ij}=$w_j\, r_{ij}$. As all criteria were treated as benefit-type criteria, the positive and negative ideal solutions were defined as the column-wise maximum and minimum values of v_{ij}, respectively. Euclidean distances to the positive and negative ideal solutions were then calculated, and the relative closeness coefficient was obtained as:

$$\mathrm{CC}_i = \frac{S_i^-}{S_i^+ + S_i^-}$$

A higher CCiCC_iCCi indicates a higher priority under the defined analytical boundary.

The decision data used in TOPSIS were not drawn from raw supplier databases. They were reconstructed from publicly disclosed case evidence and coded into a unified ordinal scale ranging from 1 to 5. Environmental criteria were scored based on disclosed targets, material-substitution signals, and circularity-related evidence, whereas governance criteria were scored based on disclosures on transparency, responsible sourcing, and traceability. In this framework, AHP determines the relative importance of the criteria, and TOPSIS evaluates the comparative performance of each archetype based on those weights.

This design allows heterogeneous public evidence to be translated into a consistent decision structure while keeping the weighting logic explicit and the ranking process auditable. The resulting workflow provides the analytical basis for the comparative results reported in the next section.

4 Results and Discussion

4.1 Operationalized Case Evidence and Decision Matrix

The primary output of this study at the case level is not an overall brand assessment of Stella McCartney, but the consolidation of dispersed public evidence into a supply-chain prototype that can be compared through an interpretable decision-support procedure. Under incomplete disclosure, insufficient evidence was not treated as missing data. Instead, it was coded conservatively using the same rule-based rubric, so that the resulting matrix could be entered into the AHP–TOPSIS process as a complete ordinal dataset.

Official disclosures were restructured into three archetype-based alternatives of equal analytical status. A1 represents the Regenerative Supply Archetype, corresponding to regenerative agriculture and regenerative cotton pathways. A2 represents the Bio-based Innovation Archetype, corresponding to next-generation bio-based and alternative material innovation pathways. A3 represents the Conventional Baseline Archetype, corresponding to existing outsourced production configurations, where transparency mechanisms are more visible but deep pathway-level traceability remains limited. This treatment converts dispersed brand practices into comparable decision objects rather than treating them as direct measures of whole-brand sustainability performance.

The indicator level was condensed into four criteria to maintain comparability within the current disclosure boundary. The environmental dimension includes emission-reduction potential and material circularity/sustainable material intensity, while the governance dimension includes supply-chain transparency, responsible sourcing, and traceability. Environmental scores were derived from publicly disclosed climate targets, material-substitution signals, and evidence of circular input. Governance scores were derived from transparency disclosure, responsible sourcing arrangements, supplier oversight, and traceability-related evidence. The detailed evidence-to-score mapping is provided in Appendix Table A1, while Table 1 reports the compact decision matrix used for subsequent TOPSIS calculation.

All criteria are treated as benefit-type criteria. The case matrix is defined as:

$$X = [x_{ij}], i = 1, \dots, m; \; j = 1, \dots, n$$

where A_i denotes the reconstructed archetype-based alternative, C_j denotes the evaluation criterion, and x_{ij} denotes the coded ordinal score of alternatives A_i under criterion C_j. The matrix reports pre-normalization values. Vector normalization was applied only during the TOPSIS computation stage.

Table 1 Initial Decision Matrix for Archetype-Based Alternatives

Alternative (Ai)	C1 Emission-reduction potential	C2 Material circularity / sustainable material intensity	C3 Supply chain transparency	C4 Responsible sourcing and traceability
A1 Regenerative Supply Archetype	4	4	3	4
A2 Bio-based Innovation Archetype	3	5	2	2
A3 Conventional Baseline Archetype	2	2	4	3

Note. C1 = emission-reduction potential; C2 = material circularity/sustainable material intensity; C3 = supply-chain transparency; C4 = responsible sourcing and traceability. Scores range from 1 to 5, where higher values indicate stronger publicly disclosed evidence under the corresponding criterion. All criteria are benefit-type criteria.

Although current public data are insufficient to construct a supplier-level performance matrix, they are sufficient to support a computable evaluation space organised by supply-chain archetype and integrating both environmental and governance dimensions. For this study, this step fulfils the first research objective by establishing an operational, comparable, and AHP–TOPSIS-compatible composite indicator system under incomplete public disclosure.

4.2 AHP weights and illustrative TOPSIS prioritisation

This study further employs the AHP–TOPSIS methodology to establish a results chain encompassing 'weighting–aggregation–ranking'. Based on pairwise comparison results from five experts, the comprehensive judgement matrix is presented in Table 2 following geometric mean aggregation. This matrix represents a collective outcome derived from the geometric mean of individual matrices that passed consistency testing, rather than a single expert's assessment. Weighting results and consistency verification are detailed in Table 3. The results indicate that, under the current expert weighting and prototype reconstruction settings, environmental indicators carry higher overall weights than governance indicators. Emissions reduction and circularity exert a more direct influence on the formation of the comprehensive priority order, while transparency, responsible procurement, and traceability primarily serve supplementary corrective functions. Within the current operationalised matrix, environmental-related criteria contribute more directly to the baseline-approximation pattern, whereas governance-related criteria primarily function to adjust boundaries and shape the order.

Table 2 Aggregated Group Pairwise Comparison Matrix for AHP Criteria

Criteria	C1 Emission Reduction	C2 Circularity	C3 Transparency	C4 Traceability
C1 Emission Reduction	1.000	1.351	1.516	2.187
C2 Circularity	0.740	1.000	1.272	1.465
C3 Transparency	0.660	0.786	1.000	1.320
C4 Traceability	0.457	0.683	0.758	1.000

Note. The matrix was obtained by element-wise geometric aggregation of expert judgements that passed consistency screening.

Building on this foundation, this paper performs TOPSIS calculations for three archetype-based alternatives, with the results presented in Table 3. These results primarily demonstrate the framework's ability to distinguish among different pathway archetypes under a unified metric structure. The results indicate that, under the current weighting scheme and operationalisation rules, A1exhibits the highest relative proximity, followed by A2, with A3 ranking last. This prioritisation holds solely within the current archetype reconstruction setting and does not constitute an extrapolated judgement regarding the brand's overall or actual supply chain performance.

Table 3 AHP Weights and TOPSIS-Based Illustrative Prioritisation of Reconstructed Archetypes

Part	Item	Value	Rank
AHP Weights	C1 Emission Reduction	0.351	1
	C2 Circularity	0.261	2
	C3 Transparency	0.219	3
	C4 Traceability	0.168	4
Consistency Test	λ_max	4.003	—
	CI	0.001	—
	CR	0.001	—
TOPSIS Ranking	A1 Regenerative Supply Archetype	0.750	1
	A2 Bio-based Innovation Archetype	0.524	2
	A3 Conventional Baseline Archetype	0.329	3

Note. Since CR < 0.10, the aggregated judgement matrix satisfies the AHP consistency requirement, and the derived weights are acceptable for subsequent TOPSIS analysis.

For this study, the weightings and prioritisation results in Section 4.2 primarily serve to demonstrate the methodology rather than to provide empirical performance judgements for real-world supply chain entities. Findings indicate that, within the current archetype reconstruction setting, environmental evidence and governance evidence can be integrated into a single computational framework, yielding interpretable comparative prioritisation. The ranking of A1, A_2, and A_3 serves solely to demonstrate the process's ability to distinguish between different path archetypes and provides a baseline for subsequent boundary tests. It should not be extrapolated as a definitive conclusion for the brand as a whole or for real-world market entities.

4.3 Robustness and discussion

Robustness analysis was conducted using the same initial decision matrix under three alternative weighting settings: equal weighting, governance-priority weighting, and one-at-a-time local perturbations around the baseline AHP vector. Across all scenarios, A1 remained ranked first, indicating that its comparative advantage is not sensitive to moderate changes in weighting assumptions. Under equal weighting and local perturbation conditions, the ranking order remained A1 > A2 > A3. A shift appeared only in the governance-priority scenario, where the middle order changed to A1 > A3 > A2. Under this setting, the relative closeness values of A1, A2, and A_3 were 0.713, 0.374, and 0.491, respectively. The difference between A2 and A3 under this scenario was therefore limited in magnitude, but sufficient to reverse their middle-order positions when governance-related criteria were given greater weight. This result suggests a bounded sensitivity in the middle-ranking alternatives rather than a broad reversal of the decision structure. In fashion supply chain decision-making, this variation is better understood as a context-dependent signal: when governance-related criteria receive greater emphasis, the comparative positions of archetypes may change, while the overall analytical boundary remains stable.

Table 4 Robustness Check under Alternative Weighting Scenarios

Scenario	Weights (C1, C2, C3, C4)	Relative closeness (A1, A2, A3)	Rank order	Observation
Baseline AHP	(0.351, 0.261, 0.219, 0.168)	(0.750, 0.524, 0.329)	A1 > A2 > A3	Baseline result
Equal weight	(0.250, 0.250, 0.250, 0.250)	(0.726, 0.465, 0.405)	A1 > A2 > A3	Stable order
Governance-priority	(0.200, 0.200, 0.300, 0.300)	(0.713, 0.374, 0.491)	A1 > A3 > A2	Middle-order shift
Local perturbation	One-at-a-time ±10%, renormalized	A1: 0.739–0.761; A_2: 0.504–0.542; A_3: 0.309–0.348	A1 > A2 > A3	Stable under perturbation

Note. All scenarios were recalculated using the same initial decision matrix. The local perturbation test applies one-at-a-time ±10% changes to the baseline AHP vector, followed by renormalization to keep the weight sum equal to 1.

5 Conclusion

This study develops a data-driven decision-support framework for comparative analysis in fashion supply chains under incomplete public disclosure. By combining rule-based evidence processing with an Environment–Governance AHP–TOPSIS workflow, it converts fragmented environmental and governance information into comparable decision inputs. Using Stella McCartney as an illustrative case, the study reconstructs three pathway-level archetypes and demonstrates the analytical sequence from evidence extraction and coding to weighting, ranking, and robustness testing. The results should therefore be interpreted as a methodological demonstration within a defined analytical boundary rather than a definitive judgement on real supply chain entities.

The study also has clear limitations. It relies on publicly disclosed information and compares reconstructed archetypes rather than complete brand operations. Conservative coding improves comparability, but it may underestimate some indicators when actual implementation exceeds the disclosed evidence. Future research may incorporate finer-grained data, including supplier-level production records, facility-level environmental reporting, third-party audit reports, and traceability disclosures. It may also extend the framework to cross-brand comparisons within a common analytical boundary to examine whether the ranking logic remains stable across different cases.

6 Acknowledgements

The authors would like to thank the participating experts and research colleagues for their valuable comments and support during the development of this study.

7 References

[1] Kering: ‘Environmental profit & loss account (EP&L): methodological note’ (Kering, Paris, 2022)
[2] Tandon, A., Dhir, A., Kaur, P., et al.: ‘Ethical sourcing and decision making in the fashion industry: A longitudinal qualitative examination’, J. Bus. Ethics, 2025, 196, (4), pp. 723–751, doi: 10.1007/s10551-024-05876-9
[3] Garcia-Torres, S., Rey-Garcia, M., Sáenz, J.: ‘Enhancing sustainable supply chains through traceability, transparency and stakeholder collaboration: A quantitative analysis’, Bus. Strategy Environ., 2024, 33, (7), pp. 7607–7629, doi: 10.1002/bse.3884
[4] Jestratijevic, I., Uanhoro, J.O., Rana, M.R.I.: ‘Transparency of sustainability disclosures among luxury and mass-market fashion brands: Longitudinal approach’, J. Clean. Prod., 2024, 436, 140481, doi: 10.1016/j.jclepro.2023.140481
[5] Riemens, J., Lemieux, A.-A., Lassagne, M., et al.: ‘Apprehending traceability implementation in support of sustainable value chains: A novel analysis framework for the fashion industry’, J. Clean. Prod., 2023, 414, 137501, doi: 10.1016/j.jclepro.2023.137501
[6] Phan Ha, N.N., Nguyen, D.D., Le, S.T.Q.: ‘Sustainable supplier selection in the apparel industry: An integrated AHP-TOPSIS model for multi-criteria decision analysis’, Res. J. Text. Apparel, 2025, 29, (4), pp. 822–841, doi: 10.1108/RJTA-04-2024-0056
[7] Ecer, F., Pamucar, D.: ‘Sustainable supplier selection: A novel integrated fuzzy best worst method (F-BWM) and fuzzy CoCoSo with Bonferroni (CoCoSo’B) multi-criteria model’, J. Clean. Prod., 2020, 266, 121981, doi: 10.1016/j.jclepro.2020.121981

APPENDIX A. Evidence-to-Score Mapping and Operationalized Values for Archetype-Based Alternatives

Alternative	Criterion	Evidence basis / coding cue	Score	Type
A1 Regenerative Supply Archetype	C1 Emission-reduction potential	Regenerative cotton / regenagri® pathway disclosed; aligned with lower-impact agricultural transition logic	4	Benefit
A1 Regenerative Supply Archetype	C2 Material circularity / sustainable material intensity	SÖKTAŞ regenerative cotton; regenagri®-certified cotton denim	4	Benefit
A1 Regenerative Supply Archetype	C3 Supply chain transparency	Named project and sourcing partnership disclosed, but no full pathway-level supplier transparency	3	Benefit
A1 Regenerative Supply Archetype	C4 Responsible sourcing and traceability	Partnership-based sourcing evidence and traceability-related implementation disclosed	4	Benefit
A2 Bio-based Innovation Archetype	C1 Emission-reduction potential	MIRUM®, Kelsun™, BioCir® Flex and similar low-impact material innovations disclosed; no pathway-specific quantified emissions value	3	Benefit
A2 Bio-based Innovation Archetype	C2 Material circularity / sustainable material intensity	Multiple next-generation, biobased, or alternative materials disclosed on official pages	5	Benefit
A2 Bio-based Innovation Archetype	C3 Supply chain transparency	Product/material innovation disclosed, but supplier-pathway visibility remains limited	2	Benefit
A2 Bio-based Innovation Archetype	C4 Responsible sourcing and traceability	Brand-level responsible sourcing applies, but pathway-specific traceability evidence remains limited	2	Benefit
A3 Conventional Baseline Archetype	C1 Emission-reduction potential	Corporate climate targets apply, but the baseline outsourced configuration is not disclosed as a distinct lower-impact pathway	2	Benefit
A3 Conventional Baseline Archetype	C2 Material circularity / sustainable material intensity	No explicit regenerative or next-generation material identity defines the baseline pathway	2	Benefit
A3 Conventional Baseline Archetype	C3 Supply chain transparency	Direct Tier 1 supplier list released on Open Supply Hub; ETI Corporate Transparency Framework satisfied	4	Benefit
A3 Conventional Baseline Archetype	C4 Responsible sourcing and traceability	Modern Slavery Statement, responsible sourcing governance, and supplier oversight disclosed; deep pathway-level traceability remains limited	3	Benefit

Note. Scores were assigned using a unified 1–5 ordinal rubric: 1 = no available evidence or weak signal; 2 = general commitment; 3 = institutional arrangement; 4 = implementation or project-level evidence; 5 = finer-grained pathway-level evidence. The appendix table provides the audit trail for the scores reported in Table 1.